Pacific Gas and Electric Company

Lawrence F. Womack
Vice President
Nuclear Services

Diablo Canyon Power Plant
P. O. Box 56
Avila Beach, CA 93424

External: 805.545.4600
Fax: 805.545.4234

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PG&E Letter DCL-04-095

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
60-Day Response to NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors"

Dear Commissioners and Staff:

Enclosed is the 60-day response for Diablo Canyon Power Plant Units 1 and 2 to NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors."

NRC Bulletin 2004-01 was issued on May 28, 2004, to advise pressurized water reactor (PWR) addressees that current methods of inspecting Alloy 82/182/600 materials used in the fabrication of pressurizer penetrations and steam space piping connections may need to be supplemented with additional measures to detect and adequately characterize flaws due to primary water stress corrosion.

The Bulletin requested information from all PWR addressees related to:

- the materials from which the pressurizer penetrations and steam space piping connections were fabricated, and

- inspections that have been or will be performed to ensure that degradation of Alloy 82/182/600 materials used in fabrication of pressurizer penetrations and steam space piping connections will be identified, adequately characterized, and repaired.

The Bulletin also required that a written response be submitted to the NRC in accordance with the provisions of 10 CFR 50.54(f).

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If you have questions regarding this response, please contact Mr. Stan Ketelsen at (805) 545-4720.

Sincerely,

Lawrence F. Womack
Vice President – Nuclear Services

mjr/4557
Enclosures
cc: Edgar Bailey, DHS
Bruce S. Mallett
David L. Proulx
Diablo Distribution
cc/enc: Girija S. Shukla

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	Docket No. 50-275
PACIFIC GAS AND ELECTRIC COMPANY	)	Facility Operating License No. DPR-80
Diablo Canyon Power Plant	)	Docket No. 50-323
Units 1 and 2	)	Facility Operating License No. DPR-82

AFFIDAVIT

Lawrence F. Womack, being of lawful age, first being duly sworn upon oath says that he is Vice President – Nuclear Services of Pacific Gas and Electric Company; that he has executed this response to NRC Bulletin 2004-01 on behalf of said company with full power and authority to do so; that he is familiar with the content thereof; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

Lawrence F. Womack
Vice President – Nuclear Services

Subscribed and sworn to before me this 27th day of July 2004.

Notary Public
County of San Luis Obispo
State of California

CHUCK MACKEY
Commission # 1397547
Notary Public - California
San Luis Obispo County
My Comm. Expires Feb 1, 2007

60-Day Response to NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors"

On May 28, 2004, the NRC issued Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors." [1] The NRC requested the following:

NRC Request 1:

All subject pressurized water reactor (PWR) addressees are requested to provide the following information within 60 days of the date of this bulletin.

PG&E Response:

PG&E is providing this response within 60 days.

NRC Request 1(a):

- *Provide a description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to primary water stress corrosion cracking (PWSCC) should also be included.*

PG&E Response:

PG&E has confirmed that there are no Alloy 600 components, nor any Alloy 82/182 welds in the Diablo Canyon Power Plant (DCPP) Unit 1 pressurizer. Therefore, the Unit 1 pressurizer is not a concern for PWSCC.

PG&E has confirmed that there are no Alloy 600 components in the Unit 2 pressurizer.

The Unit 1 and Unit 2 pressurizer heater sleeves are stainless steel with stainless steel weld materials.

[1] Note that the pressurizer surge line welds are not in the scope of Bulletin 2004-01.

Table 1 below identifies the Unit 2 pressurizer penetration Alloy 82/182 weld locations and design details.

Table 1 – Unit 2 Pressurizer 82/182 Butt Welds

Component	Material	Joint Design
RCS-2-RV-8010A / Line-729 (Pressurizer Nozzle to Safe End)	ER-NiCrFe Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
RCS-2-RV-8010B / Line-728 (Pressurizer Nozzle to Safe End)	ER-NiCrFe Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
RCS-2-RV-8010C / Line-727 (Pressurizer Nozzle to Safe End)	ER-NiCrFe Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
PORVs / Line-730 (Pressurizer Nozzle to Safe End)	ER-NiCrFe Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
Spray / Line-15 (Pressurizer Nozzle to Safe End)	ER-NiCrFe Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering

Table 2 and Table 3 below provide information on the pressurizer penetrations and steam space piping connections, including materials of construction joint design, and whether or not the weld was stress-relieved prior to being put into service, for Units 1 and 2, respectively.

Table 2 – DCPP Unit 1 Pressurizer Penetration and Steam Space Piping Information

Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7
Shell	Upper Head	Spray Nozzle Relief/Safety Nozzles	Spray/Relief/Safety Nozzle Safe Ends	Spray/Relief/Safety Nozzle to Spray/Relief/Safety Nozzle Safe End Welds	Instrument Nozzles - Tubing	Instrument Nozzles rolled tube to Pressurizer cladding weld
SA-533 GR. A CL. 1. Clad w/ER-309, Seam & Girth Welds ER-8018. All Post Weld Heat Treated.	SA-216 GR. WCC. Clad w/ER-309, Seam & Girth Welds ER-8018. All Post Weld Heat Treated.	SA-216 GR. WCC. Clad w/ER-309 and buttered w/ER-309 for Safe End weld. All Post Weld Heat Treated.	Stainless Steel SA-182 Type 316	Full Penetration Butt Weld, ER 308/309 filler metal*.	Stainless Steel SA-213 Type 316.	Non-pressure boundary Seal Weld ER308/309 filler metal*.
*No Post Weld Heat Treat per Assembly & Machining Drawing.						

Table 3 – DCPP Unit 2 Pressurizer Penetration and Steam Space Piping Information

Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7
Shell	Upper Head	Spray Nozzle Relief/Safety Nozzles	Spray/Relief/Safety Nozzle Safe Ends	Spray/Relief/Safety Nozzle to Spray/Relief/Safety Nozzle Safe End Welds	Instrument Nozzles - Tubing	Instrument Nozzles rolled tube to Pressurizer cladding weld
Alloy Steel SA-533 GR. A CL. 2. Clad w/ER-309, Seam & Girth Welds ER-8018. All Post Weld Heat Treated.	Alloy Steel SA-533 GR. A CL. 2. Clad w/ER-309, Seam & Girth Welds ER-8018. All Post Weld Heat Treated.	Alloy Steel SA-508 CL. 2. Clad w/ER-309 and buttered w/ER-NICr-3 for Safe End Weld. All Post Weld Heat Treated.	Stainless Steel SA-182 GR. F316L	Full Penetration Butt Weld, ER-NiCrFe-3*.	Stainless Steel SA-213 Type 316.	Non-pressure boundary Seal Weld ER308/309 filler metal*.
*No Post Weld Heat Treat per Assembly & Machining Drawing.						

NRC Request 1(b):

- *Provide a description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup non destructive examinations (NDE) was performed to characterize flaws in the leaking penetrations.*

PG&E Response:

The pressurizer is visually inspected during the Generic Letter 88-05 boric acid control program walkdowns each refueling outage and during forced outages, implemented by PG&E surveillance test procedure (STP) R-8C. This walkdown does not remove any pressurizer component insulation; however, 100 percent of the insulation areas surrounding the welds have been examined. These inspections are performed in Mode 5 (cold shutdown) at the beginning of refueling outages. Inspection personnel are certified VT-2 level II or III examiners.

The Class I welds on the three safety valve lines, the power operated relief valve (PORV) line, and the spray line have previously been scoped into the In-Service Inspection (ISI) Plan and have been ultrasonically (UT) inspected. The most recent Unit 2 inspections are listed in Table 4 below. Even small boric acid deposits would have been identified during a UT exam of these welds.

Table 4 – Recent ISI Unit 2 Pressurizer NDE

Location	Weld ID	Date
RCS-2-RV-8010A / Line-729	WIB-369SE	2R8* - 2/26/98
RCS-2-RV-8010B / Line-728	WIB-423SE	2R8 - 2/26/98
RCS-2-RV-8010C / Line-727	WIB-359SE	2R4 - 10/91
PORVs / Line-730	WIB-380SE	2R4 - 10/91
Spray / Line-15	WIB-345SE	2R7 - 4/11/96

* 2R8 = Unit 2 refueling outage eight

The Unit 2 inspections of the pressurizer penetrations demonstrated that the applicable regulatory requirements are satisfied because there was no evidence indicating any pressure boundary leakage from the pressurizer, nor was there any evidence of corrosion or wastage.

As described in the applicable regulatory requirements section of NRC Bulletin 2004-01, several provisions of the NRC regulations and plant operating licenses pertain to reactor coolant pressure boundary (RCPB) integrity and the issues addressed in the Bulletin. The Bulletin cites the following regulatory requirements as providing the basis for the bulletin assessment:

- Appendix A to 10 CFR Part 50, General Design Criteria (GDC) for Nuclear Power Plants
  - GDC 14 – Reactor Coolant Pressure Boundary
  - GDC 31 – Fracture Prevention of Reactor Coolant Pressure Boundary
  - GCD 32 – Inspection of Reactor Coolant Pressure Boundary
- Plant Technical Specifications (TS)
- 10 CFR 50.55a, Codes and Standards, which incorporates by reference Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, of the ASME Boiler and Pressure Vessel Code
- Appendix B of 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria V, IX, and XVI

GDC:

The Bulletin states that the applicable GDC include GDC 14, GDC 31, and GDC 32. GDC 14 specifies that the RCPB be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the RCPB be designed with sufficient margin to assure that the probability of rapidly propagating fracture is minimized. GDC 32 specifies that components that are part of the RCPB be designed to permit periodic inspection and testing of important areas and features to assess their structural and leak tight integrity.

As part of the original design and licensing of DCPP, PG&E demonstrated that the design of the RCPB meets these requirements. DCPP complied with these criteria in part by: 1) selecting corrosion resistant austenitic and ferrous materials with extremely high fracture toughness for RCPB materials; and 2) following NRC approved codes and standards for fabrication, erection, and testing of the pressure boundary parts. PG&E has implemented the required ASME Section XI examinations in accordance with the DCPP ISI Plan. As described above, the

requirements established for design, fracture toughness, and inspectibility in GDC 14, 31, and 32, respectively, were satisfied during the initial design and licensing, and continue to be satisfied during operation.

Based upon previous DCPP inspection history and the industry inspection results to date, PG&E is confident that the Unit 2 pressurizer is unlikely to have any leakage from stress corrosion cracking in Alloy 82/182 welds.

Plant Technical Specifications:

The limits for RCPB leakage are provided in TS 3.4.13 (i.e., 1 gallon per minute (gpm) for unidentified leakage; 10 gpm for identified leakage; and no leakage from a nonisolable fault in the RCPB). Routine surveillance testing is performed to ensure these requirements are met. Based on the few instances of flaws or leakage in industry experience, leaks from pressurizer Alloy 82/182 welds have been well below the sensitivity of on-line leakage detection systems. If measurable leakage is detected by the on-line leak detection systems, the leak will be evaluated per the TS, and the plant will be shut down if required. Upon detection and identification of a leak, corrective actions will be taken to restore RCPB integrity. PG&E continues to meet the requirements of this TS.

Inspection Requirements (10 CFR 50.55a and ASME Section XI):

The Bulletin describes the requirements for inspection in accordance with the ASME Code, detection of leakage from insulated components, and the acceptance standards if through wall leakage is detected. PG&E has complied with the inspection requirements for the Unit 2 Alloy 82/182 welds as part of the DCPP ISI Plan. In addition, the insulated pressurizer and piping areas are also inspected through the STP R-8C walkdowns each refueling outage and during forced outages.

Quality Assurance Requirements (10 CFR.50, Appendix B):

The Bulletin states that special processes, including nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criterion, and other special requirements, as required by 10 CFR 50 Appendix B, Criterion V (Instructions, Procedures, and Drawings) and, Criterion IX (Control of Special Processes). DCPP programs comply with these requirements.

As described above, DCPP has performed routine inspections of these welds as required by the DCPP ISI Plan. These inspections have been performed and documented in accordance with ASME Section XI, 1989 Edition. As described above, PG&E has committed to perform visual inspections of these welds on an

ongoing basis. Qualified personnel using qualified procedures, in accordance with 10 CFR 50 Appendix B requirements, will conduct the inspections.

Criterion XVI of 10 CFR 50 Appendix B states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. For significant conditions adverse to quality, the measures taken shall include root cause determination and corrective action to preclude repetition of the adverse conditions.

If any cracking, leakage or degradation is detected during the pressurizer inspection, corrective actions will be taken in accordance with the DCPP corrective action program and plant procedures. Any RCPB leakage or degradation would be considered a significant condition adverse to quality and appropriate actions, including performing a cause analysis, will be taken.

NRC Request 1(c):

Provide a description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what followup NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

PG&E Response:

PG&E will perform a bare metal visual (BMV) inspection of each identified weld location with Alloy 82/182 in the Unit 2 pressurizer every refueling outage, including 100 percent of the circumference of the welds. The list of those locations is provided in Table 1. PG&E will remove sufficient insulation to allow a BMV inspection of each of the welds containing Alloy 82/182 weld material.

It is anticipated that direct visual examination will be performed. In areas where direct visual examination is not feasible or where remote techniques will result in equivalent examinations with reduced dose received, remote visual examination equipment may be used to perform the examination. The remote examination

system provides visual resolution equivalent to a direct VT-2 visual examination as specified in the appropriate paragraphs of the 1992 edition of the ASME Section XI Code.

Personnel performing the examinations will be certified, at a minimum, as VT-2 Level II visual examiners in accordance with the requirements of ASME Section XI, 1989 Edition or later approved Code editions. Should additional NDE techniques be utilized for followup examinations, personnel involved will be qualified in accordance with ASME Section XI, 1989 Edition or later approved Code editions, if there are qualifications applicable to the examination technique.

Any accumulations of boric acid residue on or around the weld areas will be investigated to determine the origin of the deposit. If through wall leakage is suspected or if through wall leakage would be masked by leakage from other components, additional NDE techniques such as UT, eddy current or radiographic techniques will be used to characterize any indications. ASME Code requirements for evaluation and repair of any flaws detected will be followed. The inspections will be documented on examination data sheets.

If any cracking, leakage or degradation is detected during the pressurizer inspection, corrective actions will be taken in accordance with the DCPP corrective action program and plant procedures. Any RCPB leakage or degradation would be considered a significant condition adverse to quality and appropriate actions, including performing a cause analysis, will be taken.

If circumferential flaws are found in any portion of the Alloy 82/182 pressurizer welds, additional NDE techniques such as ultrasonic, eddy current or radiographic techniques will be used on all of the welds listed in Table 1 to determine the extent of condition and to identify any other evaluation or repairs required by the ASME Code.

Based on the information contained in the responses to the preceding questions, and for the following reasons, PG&E has concluded it has reasonable assurance that the DCPP Unit 2 pressurizer and connected piping are capable of fulfilling all applicable licensing and design basis requirements.

During the twelfth refueling outage of Unit 2, scheduled to begin in October 2004, PG&E will perform an inspection of the Unit 2 pressurizer Alloy 82/182 welds as described above. Any leakage, degradation or other conditions adverse to quality will be appropriately addressed as stated above. Specific licensing basis requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections are addressed in the response to NRC Request 1(b). PG&E will continue to meet these requirements.

In consideration of potential conditions adverse to quality, PG&E has been actively participating in industry organizations (Westinghouse Owners Group and Material Reliability Program) and continues to be aware of industry experience.

NRC Request 1(d):

In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

PG&E Response:

To date, flaws in Alloy 82/182 welds have been detected through visual examination or routine inspections required by the ASME Section XI Code. As discussed in NRC Information Notice (IN) 2004-11, flaws in pressurizer welds were determined to be axial. These flaws would not be expected to propagate into the carbon steel vessel or stainless steel piping components. The flaws reported in IN 2004-11 and industry experience such as the V.C. Summer hot leg weld crack have not been near critical flaw size, and have retained significant strength and weld integrity.

The DCPP Unit 1 and Unit 2 pressurizers do not contain Alloy 600 heater sleeves and welds, and leakage has not been reported through stainless steel heater sleeves.

As stated above, PG&E will perform a bare metal visual (BMV) inspection of each identified weld location in the DCPP Unit 2 pressurizer with Alloy 82/182 every refueling outage, including 100 percent of the circumference of the welds. The list of those locations is provided in Table 1. PG&E will remove sufficient insulation to allow a BMV inspection of each of the welds containing Alloy 82/182 weld material. These inspections provide adequate assurance that any leakage will be detected at an early stage and can be corrected to ensure continued compliance with GDC 14 and 31 and retain an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

NRC Request 2:

Within 60 days of plant restart following the next inspection of the Alloy 82/182/600 pressurizer penetrations and steam space piping connections, the subject PWR licensees should either:

(a) Submit to the NRC a statement indicating that the inspections described in the licensee's response to item (1)(c) of this bulletin were completed and a

description of the as-found condition of the pressurizer shell, any findings of relevant indications of through-wall leakage, followup NDE performed to characterize flaws in leaking penetrations or steam space piping connections, a summary of all relevant indications found by NDE, a summary of the disposition of any findings of boric acid, and any corrective actions taken and/or repairs made as a result of the indications found,

or

(b) if the licensee was unable to complete the inspections described in response to item (1)(c) of this bulletin, submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the pressurizer shell, any findings of relevant indications of through-wall leakage, followup NDE performed to characterize flaws in leaking penetrations or steam space piping connections, a summary of all relevant indications found by NDE, a summary of the disposition of any findings of boric acid, and any corrective actions taken and/or repairs made as a result of the indications found. In addition, supplement the answer which you provided to item (1)(d) above to explain why the inspections that you completed were adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility

For lines attached directly to the pressurizer, with the exception of the surge line, the information requested in (1) and (2) above should be provided for any locations, including those remote from the pressurizer shell, which contain Alloy 82/182/600 materials which are exposed to conditions similar to those of the pressurizer environment.

PG&E Response:

PG&E will provide the requested information within 60 days after plant restart following the next inspection of the Alloy 82/182 pressurizer penetrations and steam space piping connections for Unit 2.